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2-Component Sensor F_z, M_z

Type 9345B, 9365B

–20 … 20 kN and –200 … 200 N·m

This installation-friendly, piezoelectric 2-component sensor is suitable for measuring push/pull force F_z and a torque M_z acting on the sensor axis. Its high resolution allows measurement of the slightest dynamic changes in large forces and torques at non-rotating shafts.

- Very compact, ready to install sensor
- High rigidity and high natural frequency
- Flexible adaption with mounting threads in double flanges
- Centering seats for coaxial mounting and optimum introduction of torque
- Center hole for shaft passage

Description

Pressure and shear sensitive quartz disks are integrated under high preload between a hollow preload screw and a nut designed as the sensor case. Because of the extremely high rigidity of the sensor elements, the components F_z and M_z are measured practically without change of stroke or angle. The force and torque-proportional charge signal is picked up by electrodes and fed via a shielded cable to the charge amplifier. The latter converts the charge signals into proportional output voltages, which can be recorded and evaluated.

Flanges with tapped holes in the top and bottom sides of the sensor allow simple mounting on a shaft or adapter flange. Centering seats on both sides permit a very accurate coaxial fitting and a centric bore allows shafts to be inserted.

The sensor is rust-resistant and splash-water-protected. Together with the connecting cable Type 1698AD2, the sensor achieves the degree of protection IP65.

It should be noted that the measuring ranges are reduced by combined and eccentric loads.
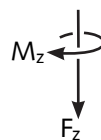
Type 9365B   Type 9345B

Application

- Measuring feed force and torque when drilling, thread cutting etc.
- Monitoring of screw driving processes and testing threaded fasteners
- Testing springs (torsion)
- Measurements on small thrust bearings, friction clutches etc.
- Measuring starting torques, irregular motion and torsional vibration on small servo and stepping motors
- Testing rotary switches and screw caps

Technical Data

		Type	9345B	9365B
Measuring range	F_z	kN	–10 … 10	–20 … 20
	M_z	N·m	–25 … 25	–200 … 200
Overload	F_z	kN	–12/12	–24/24
	M_z	N·m	–30/30	–210/210
Calibrated measuring ranges				
100 %	F_z	kN	0 … 10	0 … 20
	M_z	N·m	0 … 25	0 … 200
			0 … –25	0 … –200
10 %	F_z	kN	0 … 1	0 … 2
	M_z	N·m	0 … 2,5	0 … 20
			0 … –2,5	0 … –20
Sensitivity	F_z	pC/N	≈–3,7	≈–3,6
	M_z	pC/N·m	≈–190	≈–140

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	Type		9345B	9365B
Threshold	F$_z$	N	<0,02	<0,02
	M$_z$	mN·m	<0,35	<0,62
Linearity,	F$_z$	%FSO	≤±0,3	≤±0,3
all ranges	M$_z$	%FSO	≤±0,3	≤±0,3
Hysteresis,	F$_z$	%FSO	≤0,5	≤0,5
all ranges	M$_z$	%FSO	≤0,5	≤0,5
Max. bending moment				
M$_x$, M$_y$		N·m	14,3	
(M$_z$ = 25 N·m; F$_z$ = 0)				
M$_x$, M$_y$		N·m		440
(M$_z$ = 200 N·m, F$_z$ = 0)				
Shear force max.				
F$_{x,y}$		kN	0,1[1]	
(M$_z$ = 25 N·m; F$_z$ = 0)				
M$_z$		kN		0,43[1]
(M$_z$ = 200 N·m; F$_z$ = 0)				
Crosstalk				
M$_z$ → F$_z$		N/N·m	≤±2	≤±1
M$_b$ → F$_z$		N/N·m	≤±0,5	≤±0,5
F$_{x,y}$ → F$_z$ (typical)		N/N	≤±0,02	≤±0,02
F$_z$ → M$_z$		mN·m/N	≤±0,04	≤±0,08
M$_b$ → M$_z$		N·m/N·m	≤±0,02	≤±0,01
F$_{x,y}$ → M$_z$ (typical)		mN·m/N	≤±0,3	≤±0,3
Rigidity				
c$_z$ (F$_z$)		kN/μm	≈1,7	≈2,8
cφ (M$_z$)		N·m/μrad	≈0,19	≈0,92
Natural frequency				
f$_n$ (z)		kHz	>41	>33
f$_n$ (M$_z$)		kHz	>32	>25
Operating temperature range		°C	–40 … 120	–40 … 120
Temperature coefficient of sensitivity				
F$_z$		%/°C	–0,02	–0,02
M$_z$		%/°C	–0,01	–0,01
Capacitance				
C$_{Fz}$		pF	≈65	≈150
C$_{Mz}$		pF	≈340	≈350
Insulation resistance at 20 °C		Ω	>10^{13}	>10^{13}
Degree of protection (with cable connected)		EN60529	IP65	IP65
Connector			V3 neg.	V3 neg.
Case material		DIN	1.4542	1.4542
Weight		g	267	834
Tightening torque M$_A$ (recommended)		N·m	4	21

[1] Force applied in the flange plane

Dimensions 2-Component Sensor F$_z$, M$_z$
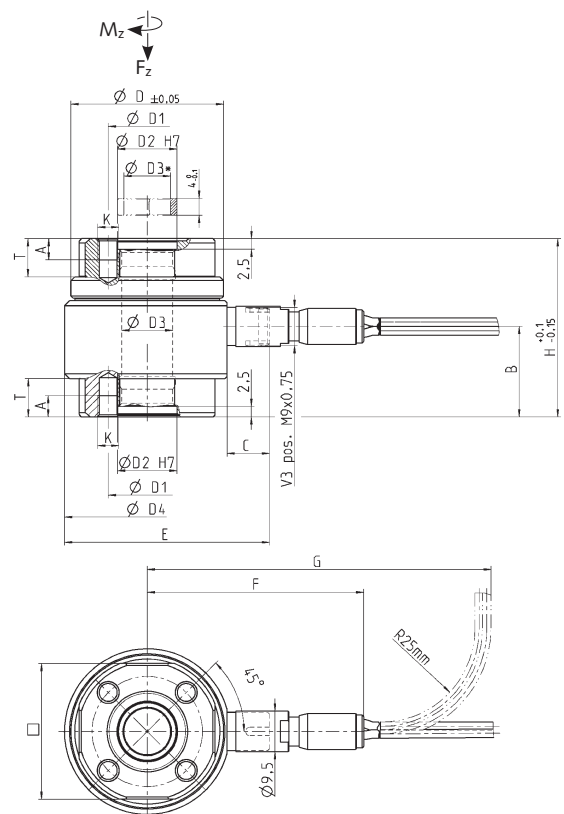
Fig. 1: Dimensions 2-component sensor F$_z$, M$_z$, Type 9345B, 9365B

Type	D	D1	D2	D3	D3*	D4	□	H	A
9345B	36	26	14	11	11	39	32	42	5
9365B	54	40	21	17	17	56,5	48	60	8

Type	B	C	E	F	G	K	T
9345B	21,7	10	48,3	51	81	M5	9
9365B	31,8	10	66	60	90	M8	13

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Mounting

Mounting is accomplished using the flanges with tapped holes on both sides of the sensor. The contact surfaces to the sensor must be flat, rigid and clean. Centering seats and centering rings (included accessories) are provided to allow as accurate as possible coaxial fitting. Torque should be introduced with the smallest possible eccentricity (<0,02 mm) of the axes to be connected. Bending moments and shear forces must be avoided as far as possible.
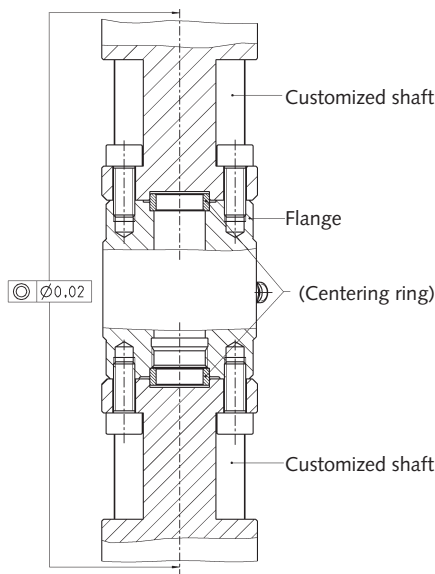
Installation

- The sensor is screwed onto a previously machined surface with four fixing screws. The mounting surface must not be painted or greased and the planeness of the contact surface must be within a tolerance of 5 microns.
- The connecting cable must be installed in such a way as to exclude any tangential, radial or axial forces to the sensor. The cable should be affixed as close as possible to the sensor on a suitable mounting surface.
- The tightening torque to be applied to each of the four fixing screws is 21 [N·m].

Fig. 2: Installation in shaft

Cable clip (Art. No. 5.210.570)
Screw (Art. No. 6.120.021)
Washer (Art. No. 6.220.022)
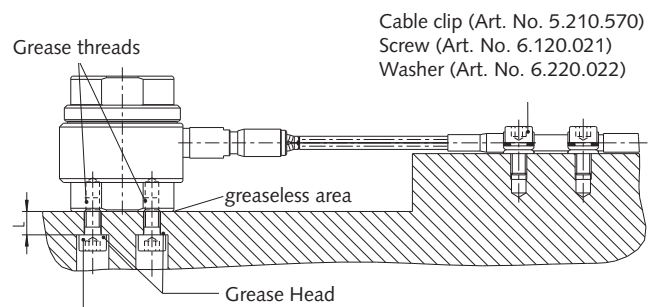
Type 9345B 4 pcs. Screw M5x12 (Art. No. 6.120.022)
Type 9365B 4 pcs. Screw M8x20 (Art. No. 6.120.038)
Tightening torques: M_v [N·m]

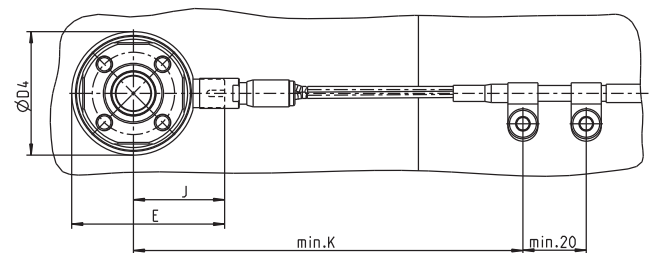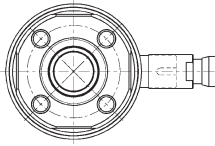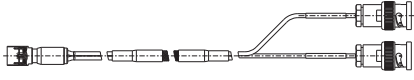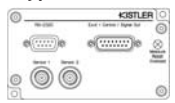Fig. 4: Installation 2-component sensor F_z, M_z

Type	D4	E	J	K	L	M_v
9345B	39	48,3	28,8	130	7,3	4
9365B	56,5	66	37,8	140	12,6	21

Fig. 3: Installation between base and cover plate

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Measuring System with 2-Component Force Link

2-Component Force Link with V3 neg. Connector	Degree of protection EN60529	Connecting Cable		Multichannel Charge Amplifier		Reading
Type 9345B Type 9365B		Type 1698AD2...		Type 5073A211		
V3 neg.	IP65	V3 pos.	2 x BNC pos.	Type 5015A... F_z	Type 5015A... M_z	F_z M_z

Included Accessories — **Art. No.**
- 2 x centering ring for Type 9345B — 3.420.180
- 2 x centering ring for Type 9365B — 3.420.181
- 2x Cable clamp — 5.210.570
- 2x screw — 6.120.021
- 2x Flat washer — 6.220.022

Optional Accessories — **Type**
- Mounting flange for Type 9345B — 9580A1
- Mounting flange for Type 9365B — 9580A2
- Connecting cable, 2 wire — 1698AD2
  V3 pos. – 2 x BNC neg., Length = 2 m

(see also data sheet for cables 1687B_000-545)

Ordering Key — **Type**
- 2-Component Sensor F_z, M_z — **9345B**
  –10 … 10 kN, –25 … 25 N·m
- 2-Component Sensor F_z, M_z — **9365B**
  –20 … 20 kN, –200 … 200 N·m

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